

DIRECT TESTIMONY OF
JOSEPH M. LYNCH
ON BEHALF OF
SOUTH CAROLINA ELECTRIC & GAS COMPANY
DOCKET NO. 2017-305-E
DOCKET NO. 2017-207-E

1 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

2 A. My name is Joseph M. Lynch, and my business address is 220 Operation
3 Way, Cayce, South Carolina.

4 **Q. HAVE YOU PREVIOUSLY SUBMITTED DIRECT TESTIMONY IN THIS**
5 **PROCEEDING?**

6 A. I have submitted pre-filed direct testimony in Docket No. 2017-370-E,
7 which has been consolidated for hearing purposes with these dockets. Because
8 this testimony addresses many of the issues raised here, that pre-filed testimony
9 and exhibits are attached as *Exhibit* __ (*JML-1A*) to this testimony and
10 incorporated by reference into my pre-filed direct reply testimony in this docket.

11 In addition, Dr. Cooper's testimony here is largely a rehash of his 2012
12 testimony, which the Commission has already considered in Docket No. 2012-
13 203-E and was rejected at that time. *See* Docket No. 2012-203-E, Order No.
14 2012-884 at 32-33. For that reason, I am incorporating my 2012 testimony into
15 this docket in response to Dr. Cooper's testimony at *Exhibit* __ (*JML-2A*).

1 **Q. WERE THERE EXHIBITS ATTACHED TO YOUR PREFILED DIRECT**
2 **TESTIMONY IN DOCKET NUMBER 2017-370-E?**

3 A. Yes. There were ten exhibits to my prefiled direct testimony in Docket No.
4 2017-370-E. They are attached to my prefiled direct testimony in this Docket as
5 *Exhibit __ (JML-1A).*

6 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

7 A. The principal purpose of my testimony is to address claims made by Dr.
8 Cooper in his direct testimony suggesting that SCE&G's economic analyses
9 regarding the nuclear units were "fatally flawed."

10 **Q. WAS THE COMPANY'S ECONOMIC ANALYSIS OF THE NEED FOR**
11 **TWO NUCLEAR UNITS AS PRESENTED IN THE 2008 SITING**
12 **HEARING UNDER DOCKET NO. 2008-196-E "FATALLY FLAWED"?**

13 A. Absolutely not. In Order No. 2009-104(A), which was entered in Docket
14 No. 2008-196-E, the Commission described the hearing conducted in that Docket
15 as comprehensive. The Commission found that "ORS relied on the expertise of its
16 staff supplemented by outside consultants with extensive experience in power
17 plant construction, construction contracting, resource planning, transmission
18 planning, load modeling, economics and environmental and nuclear permitting."
19 And that "this ORS team conducted a detailed audit and evaluation of all aspects
20 of the Company's decision to proceed with the construction of Units 2 and 3"
21 As a result of three days of hearings, the Commission found the following:

- 1) “[T]hat the record supports the Company’s testimony that the specific capacity need for 2016 and 2019 is most reliably and efficiently met through the addition of new base load capacity to its system. Units 2 and 3 represent such capacity.” Order No. 2009-104(A) at 27.
- 2) “[T]hat the load forecasts presented by Dr. Lynch and reviewed and audited by ORS Witness Dr. Zhu provide a reliable and appropriate basis for assessing the need for Units 2 and 3. The Commission finds that the Company has in fact demonstrated the need for the Units and the need to proceed with their construction.” *Id.* at 28.
- 3) “[T]hat SCE&G’s analysis of the costs of nuclear generation as compared to other alternatives is based on a reasonable assessment of the cost of Units 2 and 3. Those costs have been reasonably estimated by the Company and do not constitute a flaw in the Company’s analysis of the comparative economics of alternative generation resources as suggested by the intervenors.” *Id.* at 50.
- 4) “[T]hat the cost projections and comparative economic analyses on which the selection of Units 2 and 3 was made are reasonable and appropriate.” And further that “the Company properly concluded that the construction of Units 2 and 3 would provide the greatest and most dependable contribution to system economy of all reasonably competitive alternatives.” *Id.* at 51.

1 **Q. WERE THE THREE SUBSEQUENT ECONOMIC STUDIES FILED IN**
2 **THE 2012, 2015 AND 2016 CASES “FATALLY FLAWED”?**

3 A. Absolutely not. The Company’s economic analyses of the need for the
4 Units were not flawed. They reflected reasonable information and assumptions
5 available at the time that they were prepared. They were based on methodologies
6 and assumptions that were widely accepted in the industry and consistent with the
7 methodologies and assumptions used in preparing the Integrated Resource Plans
8 (“IRP”), which SCE&G regularly presents to this Commission. SCE&G has used
9 the approach on which these analyses were based for decades to determine the
10 most reliable and efficient means to meet the electrical service requirements of its
11 customers. In addition, the economic analyses related to the two nuclear units were
12 subject to review by the parties in each of the proceedings in which they were
13 presented and were specifically subject to review by the independent experts
14 retained by the Office of Regulatory Staff (“ORS”).

15 Regardless, these three economic analyses—and by extension Dr. Cooper’s
16 comments about them—have no relevance to the prudence of nuclear
17 construction, at least from a regulatory perspective. The Commission has
18 consistently stated that it “is mindful that a Base Load Review Order constitutes a
19 ‘final and binding determination that a plant is used and useful for utility
20 purposes’” Order No. 2009-104(A) at 8. The Commission reiterated this point
21 after reviewing the 2012 study:

1 As to the prudence of continuing construction of the Units, the
2 Commission finds that SCE&G has presented evidence establishing that the
3 most prudent, reasonable and beneficial base load resource strategy for it to
4 pursue at this time is to complete construction of the Units as proposed. The
5 evidence shows that it would not be prudent, reasonable or beneficial to
6 SCE&G or its customers to switch to a natural gas resource strategy. While
7 this finding is justified by the evidence presented at hearing, this
8 Commission also finds that the BLRA does not require that this issue be
9 relitigated once the initial finding has been made.

10
11 Order No. 2012-884 at 69. Incidentally, the South Carolina Supreme Court agreed
12 with the Commission on this point. *See S.C. Energy Users Comm. v. S. C. Elec. &*
13 *Gas*, 410 S.C. 348, 359-60, 764 S.E.2d 913, 918 (2014). Nevertheless, I will
14 respond to Dr. Cooper's six "repeated errors" he claims runs through my analyses.

15 **Q. DR. COOPER STATES THAT THE FIRST "BIG, REPEATED ERROR"**
16 **SCE&G MADE WAS FAILING TO CONTROL RISING CONSTRUCTION**
17 **COSTS. WERE THOSE ACCOUNTED FOR IN YOUR ANALYSES?**

18 A. Yes, they were. The original gross construction cost to SCE&G was \$6.313
19 billion dollars, which the Commission approved in Order No. 2009-104(A). A
20 year later Westinghouse Electric Company, LLC ("Westinghouse") provided a
21 site-specific construction schedule, and the gross construction cost was set at
22 \$6.875 billion and approved in Commission Order No. 2010-12. As a result of
23 Westinghouse signing the fixed price contract in 2016, the construction cost was
24 set at \$7.658 billion, which included a \$0.505 billion charge to compensate
25 Westinghouse for assuming the cost risk. This means Westinghouse thought it
26 could build the units with a cost to SCE&G of \$7.153 billion. Thus, the cost to
27 SCE&G during the time of the 2012, 2015 and 2016 economic studies in a sense

1 ranged from \$6.875 to \$7.153 billion. The construction costs did not vary to such
2 an extent that would have changed the results of the economic analysis showing
3 substantial benefits to customers. In addition, as I stated in Docket No. 2015-103-
4 E, and as the Commission found in Order No. 2016-661, the future capital costs of
5 the Units would have had to increase by \$3.1 billion above current forecasts to
6 make it uneconomical to continue the construction. That calculation was
7 presented to the Commission to indicate that if construction costs proved to be
8 greater than anticipated, there were still potential benefits to customers to
9 complete the Project, even at the higher cost. In the end, Westinghouse accepted a
10 fixed price option for the EPC Contract, which resulted in a cost to complete the
11 Units that was 21% greater than the cost initially presented to the Commission.
12 Had Westinghouse lived up to this commitment, there would have been no
13 economic reason to cancel the Project.

14 **Q. DR. COOPER CLAIMS THAT SCE&G'S SECOND "BIG REPEATED**
15 **ERROR" WAS THAT REALISTIC GAS PRICES WERE NOT**
16 **ANALYZED. DO YOU CONSIDER THAT A REASONABLE CRITICISM?**

17 A. No, I do not. Dr. Cooper is using hindsight to say that the decline in natural
18 gas prices should have been factored into earlier analyses. However, the shale gas
19 revolution was not anticipated, and even today it is not clear how long it can be
20 sustained. Natural gas prices are notoriously difficult to predict accurately.

21 History shows this to be the case. It became clear to natural gas markets
22 around 2000 that the supply of natural gas that was available given current

1 production methods could not keep up with the demand. As a result, the price of
2 natural gas increased rapidly. The 2008 strip of NYMEX futures contracts closed
3 at \$9.035 per MMBTU up from \$2.108 per MMBTU in 1998. That represents an
4 annual compound growth rate of 15.7% per year, for more than a 400% increase
5 over the course of 10 years. This increase was not based on a temporary market
6 aberration but on a shared understanding that gas production was not sufficient to
7 keep pace with demand. As my earlier testimony indicated, new coal capacity was
8 no longer economically viable due to environmental constraints. New natural gas
9 capacity was the only base load or intermediate capacity that was available apart
10 from nuclear. However, the growing imbalance in supply and demand for natural
11 gas in the mid to late 2000's made the choice of natural gas generation
12 economically risky. This provided significant support for the decision to build
13 nuclear units.

14 In addition, gas markets were notoriously volatile during this period and
15 prices could change dramatically from year to year or even month to month. When
16 gas supplies are short relative to demand, the price can increase quickly and can
17 fall equally quickly if supplies increased relative to demand. This sensitivity to
18 market forces is part of the reason gas prices are so hard to forecast.

19 Dr. Cooper criticizes the fact that we believe the 50% plus natural gas price
20 was the most reasonable price in evaluating our analyses. In those analyses, the
21 50% plus analysis was one of three gas price scenarios that SCE&G modeled.

1 As stated in my prior testimony, the reason for preferring the 50% plus
2 level for the long-term future gas prices is based on the correspondence to the
3 projection of natural gas prices made by the U.S. Energy Information
4 Administration (“EIA”) in their Annual Economic Outlook (“AEO”). Historically,
5 as has been testified in prior dockets, SCE&G’s base gas projection is
6 substantially lower than the EIA gas price projection. Typically, the base gas
7 projection comes into relatively close alignment with the EIA projection if the
8 base price projection is increased by 50%. For example, if you escalate the 2019
9 NYMEX strip of \$2.811 over 10 years as is done in computing the base gas
10 projection, you get a prediction of \$3.778 per MMBTU in 2029. Increase this by
11 50%, and you get \$5.667. This number aligns with EIA’s latest forecast for 2029
12 contained in their 2018 AEO at \$5.625 per MMBTU. This is their reference case,
13 and it is close to SCE&G’s 50% higher gas price methodology. This relationship
14 has held true over time. Therefore, the preference for the 50% higher price
15 scenario is reasonable.

16 **Q. DR. COOPER’S THIRD “BIG, REPEATED ERROR” IS THAT SCE&G**
17 **OVERESTIMATED DEMAND. DO YOU AGREE THAT THIS IS A**
18 **VALID CRITICISM?**

19 **A.** No, I do not. SCE&G puts significant effort into producing the best forecast
20 it can. Despite historical load growth of approximately 2.5%, in 2008, the
21 Company projected a demand growth of 1.7% over the period of 2008-2022.
22 However, growth was unexpectedly limited as a result of the 2008 downturn in the

1 economy—the Great Recession—and the unanticipated success of federally
2 mandated energy conservation and efficiency measures related to high-efficiency
3 lighting and appliance efficiency. Nonetheless, the changes in load growth which
4 Dr. Cooper references did not materially change the need or the economics of the
5 Units. SCE&G’s 2018 IRP shows the need for base load generation, and SCE&G
6 has had to make significant capacity purchases from market to cover base load
7 capacity needs. Remember that SCE&G had to retire 430 MWs of coal capacity
8 because of the MATS (“Mercury and Air Toxics Standards”) regulations. At best,
9 the lower than anticipated growth in demand has merely changed the timing at
10 which additional capacity is required. It does not change the fundamental
11 economics of the analysis.

12 **Q. DR. COOPER’S FOURTH “BIG REPEATED ERROR” IS THAT SCE&G**
13 **FAILED TO GIVE FULL CONSIDERATION TO EFFICIENCY AND**
14 **RENEWABLES. DO YOU AGREE THAT THIS IS A VALID CRITICISM?**

15 A. No, I do not, and neither did the Commission. In Docket No. 2008-196-E,
16 the Commission found “that additional savings due to DSM programs [Demand
17 Side Management, i.e., efficiency programs] are not a viable substitute for the base
18 load capacity that SCE&G seeks to build,” and “DSM is a useful supplement to
19 the generation capacity needed on SCE&G’s system. It is not a substitution for it.”
20 Order No. 2009-104(A) at 20. This is indeed the case. Demand-side management
21 programs have delayed the shortfall in base load generation but have not by any
22 means eliminated it. This is not a function of a failure of SCE&G to pursue

1 meaningful demand-side management and efficiency programs. EIA Form 861
2 data indicates that SCE&G's reduction to retail sales growth due to its efficiency
3 programs has been greater than at least 50% of the companies in the southeast
4 since 2012.

5 Similarly, regarding renewables, the Commission found "that wind, solar,
6 biomass and hydro generation were not feasible alternatives to nuclear or fossil
7 fired generation." Order No. 2009-104(A) at 33. SCE&G in fact modeled
8 renewables in its economic analyses and has always maintained a place in its
9 generation plan for reasonably anticipated contributions from solar and other
10 renewable resources. It is simply inaccurate to say that SCE&G's economic
11 analyses did not account for renewables. In fact, currently there are almost 800
12 MWs of hydro capacity on SCE&G's system and about 1,070 MWs of solar
13 capacity either operating or under signed contract. However, this renewal solar
14 capacity is intermittent, cannot be dispatched, and is not a substitute for the base
15 load generation reflected by nuclear or combined cycle natural gas generation, and
16 the hydro capacity is mostly energy limited and primarily a peaking resource.

17 **Q. DR. COOPER'S FIFTH "BIG REPEATED ERROR" IS THAT SCE&G**
18 **ERRED IN ITS CARBON EMISSION COST EVALUATIONS. IS THIS IS**
19 **A VALID CRITICISM?**

20 A. It is not. SCE&G used a range of values for CO₂ emission costs precisely
21 because the future costs were unknown and so that the Commission and others
22 would be able to gauge the impact. Second, and critically, it is the future cost of

1 emitting CO₂ that is relevant to the economic analysis—not the cost occurring
 2 today. SCE&G considered that there was a real potential for an actual cost being
 3 imposed on the emission of CO₂. For example, there has been legislation pending
 4 before the United States Congress since 1989 to limit CO₂ emissions. H.R. 4805,
 5 which was introduced in 1989 called for a carbon tax, and as recently as 2017, a
 6 Senate bill (S. 2352) proposed a cap and trade system, with many other bills
 7 proposed in between. In 2008, President Obama stated, “So, if somebody wants to
 8 build a coal power plant, they can. It’s just that it will bankrupt them because they
 9 are going to be charged a huge sum for all that greenhouse gas that’s being
 10 emitted.” The same costs would apply to a natural gas generating plant, although
 11 natural gas generates approximately 40% less carbon dioxide per MWH than coal
 12 for electric generation.

13 The past administration formed an Interagency Working Group (“IWG”) to
 14 calculate a social cost of carbon to be used in formulating regulations. The IWG
 15 published its first estimates in 2010 and then updated them several times. The
 16 following table shows their original and final estimates and one in-between.

Social Cost of CO₂ (in 2007 dollars per metric ton of CO₂) By U.S. Interagency Working Group (“IWG”)			
Year	2010	2013 Update	2016 Update
2010	\$21	32	31
2020	26	43	42
2030	33	52	50
2040	39	61	60
2050	\$45	71	69

The table above shows the CO₂ emission cost to society in 2007 dollars. The following table translates these values into current year dollars. Using the 2016 estimates, the IWG is saying that the cost to society in 2020 is about \$54 per metric ton of emitted CO₂, and that federal agencies should use that value to guide their formulation of environmental regulations. Instead of being too high, this suggests that SCE&G's range of \$0, \$15 and \$30 did not go high enough.

Social Cost of CO₂ (in current dollars per metric ton of CO₂) Assuming 2% Inflation Rate Since 2007			
Year	2010	2013 Update	2016 Update
2010	\$22	\$34	\$33
2020	\$34	\$56	\$54
2030	\$52	\$82	\$79
2040	\$75	\$117	\$115
2050	\$105	\$166	\$162

Interestingly, on July 23, 2018, Congressman Curbelo (R-FL), the co-chair of the bipartisan House Climate Solutions Caucus, introduced the MARKET CHOICE Act ("MCA"), which called for a \$24 per ton carbon tax in 2020 escalating at 2% per year above inflation. On July 25, 2018, Congressman Curbelo received a letter from 34 large companies thanking him for sponsoring this legislation. Clearly, there is a risk of future CO₂ costs.

Q. LAST, DR. COOPER CLAIMS THAT SCE&G'S SIXTH "REPEATED ERROR" WAS FAILING TO MAKE DECISIONS ON A FORWARD-LOOKING BASIS, REGARDLESS OF SUNK COSTS. WAS IT AN ERROR

1 **TO ADD THE “SUNK” COSTS RELATED TO STOPPING NUCLEAR**
2 **CONSTRUCTION ON THE GAS SCENARIO ALTERNATIVE?**

3 A. No, it was not. The economic studies filed in 2012, 2015 and 2016
4 compared two paths: continuing construction of the nuclear units or stopping
5 construction and building natural gas units. If SCE&G followed the path of
6 continuing construction, it would incur certain costs. If it followed the alternate
7 path, it would incur a different set of costs. These studies simply compared the
8 costs incurred in the two paths. Continuing construction of the nuclear units
9 proved to be the lower cost path.

10 **Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?**

11 A. Yes.